Testimony of Dr. Shirley A. Pomponi
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on
U.S. Commission on Ocean Policy:
Recommendations for an Updated National Ocean Policy

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Chairman Boehlert, Ranking Member Gordon and members of the Science Committee, I want to thank you for the opportunity to appear before you this morning and for the Committee's leadership in considering the recommendations of the U.S. Commission on Ocean Policy (Commission). I am Shirley Pomponi, Acting Managing Director of Harbor Branch Oceanographic Institution. In addition, I serve on the Commission's Science Advisory Panel.

While my testimony represents my own views, I also am testifying today as an elected member of the executive committee of the Consortium for Oceanographic Research and Education (CORE). The 76 member institutions of CORE represent the mainstream of American oceanographic research and education. Through CORE, an incredibly diverse, dynamic and independent ocean sciences community works together to develop and promote a common vision and goals.

I would like to begin by acknowledging the enormous achievement represented by the Commission's preliminary report. This bipartisan panel of 16 experts from government, academia, and industry has released the most monumental review in three decades of how our country manages its vast ocean resources. Authorized by Congress and appointed by the President, the Commission has spent the past two years considering testimony from hundreds of citizens, scientists, and policymakers. Over and over again, they heard that the oceans are in danger and that the responsible federal agencies and state and local governments are not working together effectively. Ultimately, they distilled an avalanche of material to produce a clear, stepwise plan for turning the situation around and developing a coherent national ocean policy.

This is not to say that there is agreement within the ocean community, or even within the Commission membership, on each of the Commission's recommendations. Nor does it suggest that the preliminary report comprehensively addresses each of the many ocean policy challenges that this nation faces. What the Commission has given us is a wide-ranging and honest assessment of the current status of our oceans and coasts. Its members examined everything from stewardship of marine resources and pollution prevention to enhancing and supporting marine science, commerce and transportation, and their recommendations are just as far reaching. The preliminary report offers us a

vision and starting point for addressing America's relationship to the sea. Now it is our responsibility to ensure that vision is implemented.

Ocean And Coastal Research Problems And Issues

While most Americans recognize that Earth is the only known living planet, few understand that its life is derived in large measure from its oceans. Oceanographic research to date has revealed that the seas play a critical role in regulating Earth's weather and climate, replenishing and maintaining the viability of our atmosphere, housing extraordinarily diverse forms of life, and significantly influencing the creation and ever-changing appearance of our coastlines.

Nor does the public fully understand the essential role of the oceans in our economy and to our quality of life. As the Commission points out, our nation's ocean economy contributed more than $117 billion and supported well over two million jobs in 2000. More than $1 trillion, or about a tenth of the U.S. annual gross domestic product is generated in a relatively narrow strip of land along our coasts, and almost half ($4.5 trillion) is generated in coastal watershed counties. One out of every six jobs in the United States is marine related, and over half of our population lives and works next to the Atlantic and Pacific Oceans, the Gulf of Mexico, and the Great Lakes. Overseas trade via U.S. ports is expected to double by 2024, and the growth in passenger transportation is likely to continue. Offshore areas provide 30 percent of the oil, and 25 percent of the natural gas powering our economy and our homes.

My home state of Florida is among the most reliant on healthy oceans. With an economy and lifestyle that is intimately tied to coastal proximity, Floridians can feel the effects of ocean health decline in the form of beach closings, decreases in tourism, and even poor fishing. Such consequences threaten not only a way of life, but also the continued favor of the 50 million tourists that visit each year, and the economy they support.

It is a powerful reality that knowledge of the oceans, their resources and their relationship to human activities is vital to our existence. It is a fundamental challenge for the ocean science community to convey that reality both to decision makers and to the American public. Our ability to address problems and issues in ocean and coastal research will rely in large part on our success.

Coordinating ocean and coastal research and education programs. One of the most significant conclusions of the new report is that the patchwork of agencies and processes that have evolved over the past three decades to oversee the nation's ocean interests is simply not up to the challenge of fixing the problems identified. To remedy the situation, the report recommends substantial restructuring at the federal level, including mechanisms for making ocean policy decisions through a high-level interagency governance structure.

Focusing specifically on ocean and coastal science, more than a dozen federal agencies currently fund research or education activities. Consequently, interagency coordination is

essential to avoid duplication and strengthen the scientific basis for ocean management. The Commission proposes to build on the model created under the National Oceanographic Partnership Program (NOPP) in 1997. NOPP promotes national goals of assuring national security, advancing economic development, protecting quality of life, and strengthening science education and communication through improved knowledge of the ocean. It creates a higher level of coordinated effort and synergy across the broad oceanographic community by establishing partnerships on two fronts. First, NOPP relies on collaboration among fifteen federal agencies, calling on the top official of each participating agency to serve on an interagency council that provides program oversight. Second, NOPP increases the visibility for ocean issues on the national agenda by facilitating projects among federal agencies, academia, industry, and other governmental and non-governmental organizations. While investment in the program to date has been relatively modest, it has proven to be an effective mechanism for building and coordinating federal ocean science partnerships. Consequently, the oceanographic community generally supports the Commission's recommendations to use NOPP as a model for coordinating expanded interagency ocean science investments.

Enhancing the ocean observation and operational infrastructure. The Commission report places high priority on development and implementation of a sustained and integrated ocean observing system and on enhancing ocean infrastructure and technology development. There is broad-based agreement within the oceanographic community on the need to maintain and enhance our national infrastructure for ocean observation and to support scientific operations.

The academic research fleet is the most crucial shared resource currently used by ocean and coastal researchers. Without a dependable seagoing capability, the flexibility and mobility needed to explore new areas and respond to exciting and scientifically interesting phenomena will be eliminated. One of the most acute needs of the marine science enterprise and for deploying and maintaining an integrated ocean observing system is ensuring the future of the oceanographic fleet.

Over the coming decade, nearly all mid-sized vessels classified as Regional or Ocean Class will reach the end of their design life and require replacement. In 2002, a federal interagency committee on oceanographic facilities completed a report outlining the state of the fleet and suggesting a timeline for replacement. While the Navy and the National Science Foundation have indicated that they may provide future funding for fleet renewal, neither agency has made available the funds necessary to construct new ships in the Oceans class. The Commission report recommends establishment of a modernization fund to meet such critical infrastructure and technology needs. However, it provides little detail on how such a fund would be capitalized or administered.

Comment [SAP1]: Penny, do we need to go into detail here? Does the 2002 report provide that info?

The Ocean Drilling Program (ODP) has been another important scientific platform that allows researchers to examine the past in order to understand the history of the ocean and climatic environment by retrieving and examining core samples from the ocean floor. Features like the North Atlantic Deep Water Formation, a driver of today's ocean-climate engine and the chief mechanism for the distribution of heat throughout the world's

oceans, have fluctuated at well-defined intervals during the last fifteen million years. Understanding such abrupt changes is absolutely essential for comprehending the many forces affecting our world's climate. As ODP moves into a new, international phase, the principal drilling vessel, the *JOIDES Resolution,* will be retired, and a replacement must be secured to ensure continued U.S. participation in the program. The fiscal year 2005 budget for the National Science Foundation proposes $45 million to initiate that process as part of its Major Research Equipment and Facilities Construction account.

Comment [SAP2]: Is there $$$ set aside in the NSF budget for a replacement?

While ships provide an on-site, mobile, and flexible instrument platform for research and observation, long-term, *in situ* observations are critical to understanding ocean processes. Results from activities such as the tropical atmosphere-ocean buoy array that monitors the El Niño Southern Oscillation in the Pacific, the Pirata Array in the tropical Atlantic, and free-drifting ARGO profiling floats are proving the value of long time series observations, and developing the scientific foundation needed to better understand the global climate. Moreover, these systems demonstrate that changes in distant oceans can affect the coastal oceans of our nation.

It is critical that we expand the reach of our ocean observing systems throughout the marine environment, including our nation's coastal areas. In addition, we must develop and deploy a robust data integration and management system and enhance our modeling capability to ensure full benefit and use of observational products from this system. Such an end-to-end approach from observations to analysis to modeling is critical if we are to improve both our understanding of the ocean as well as to develop decision support capabilities regarding ocean policy and management.

In order to progress and enhance our nation's ocean observing abilities, supporting a strong and vigorous program of research and development is essential. The National Science Foundation is proposing an Ocean Observatories Initiative to explore new scientific questions that require a sustained, multi-year, real-time observation capability. This is an important step in maintaining our ocean science leadership. Other technological needs that should be examined include the scientific demand for deep-diving vehicles, dedicated platforms to support ocean exploration, and remote sensing capabilities.

Advancing ocean education. The Commission has made promotion of lifelong ocean education a centerpiece of its preliminary report. The report stresses the central role of both formal and informal education efforts for Americans of all ages from kindergarten through retirement, stating:

Comment [SAP3]: This section is long, compared to the other sections. It might imply that education is our top "research" priority.

> "To successfully address complex ocean- and coastal-related issues, balance the use and conservation of marine resources, and realize future benefits from the ocean, an interested, engaged public will be needed."

The Commission proposes to accomplish this by: (1) building a collaborative ocean education network that links research and education communities; (2) integrating the

oceans into elementary and high school education programs; (3) investing in higher education and the ocean workforce; and (4) strengthening informal education programs.

I think the vast majority of my colleagues join me in supporting the Commission's focus on education. Moreover, I completely agree that a knowledgeable public is the real key to sustainable ocean policies. Ocean scientists need to improve our communication with the American public about the value of the science we do. It has been said that the U.S. space exploration program enjoys the support that it has because everyone can look up into the sky. On the other hand, not everyone lives on the coast and can see the ocean. Not everyone understands the value of ocean exploration to the discovery of new fisheries, new drugs, and new energy sources; to predicting phenomena such as El Niño and harmful algal blooms (and their impact on our health and economy); and to protecting our coastlines from both natural and man-made threats to our health and security.

Not surprisingly, CORE has been particularly active and interested in the Commission's recommendations on investing in higher education and the ocean workforce. Graduate education in the United States is based upon a strong national research infrastructure at centers of higher education and research. The future quality of ocean sciences in the United States and our nation's capability to understand and manage marine issues related to environmental quality, economic well-being, and national security depend upon maintaining graduate educational programs of high caliber. This area of education cannot be the concern of a single agency. All ocean agencies depend upon a well-educated and well-trained workforce and need to assume responsibility for this endeavor.

The Commission offers a number of recommendations to strengthen the role of science education as a specific part of each federal ocean agency's mission. Currently NSF and NASA are the only agencies that include education in their missions. Other "mission-oriented" agencies such as the Navy, NOAA, the U.S. Geological Survey (USGS) and the Environmental Protection Agency (EPA) all support science education to varying degrees—most commonly through graduate student research assistantships. At the same time, such support is vulnerable to budget cuts if education is not perceived by the executive branch to be a part of the agencies' core missions. Given each agency's workforce needs, it is essential that they provide significant financial assistance for supporting graduate students in order to ensure continued agency capabilities as well as the future health of the profession.

The financial aid system for graduate students in the ocean sciences depends primarily upon research assistantships and currently falls below other sciences. Over 50% of all graduate students in residence during fall 2001 were supported through research assistantships. In comparison, NSF and the National Aeronautics and Space Administration (NASA) offered an average of 15 graduate fellowships per year between 1995 and 2000. NSF also funded an average of 6 traineeships per year between 1995 and 2000. By contrast, the federal government supported almost 17,000 graduate traineeships and fellowships for all science and engineering fields during 2000.

While research assistantships are appropriate for supporting field-based graduate student research, traineeships allow the best students to support themselves in non-traditional educational programs that are often interdisciplinary and can produce a masters or doctorate with the knowledge of science, management and communications that is so desperately needed in our ocean-related workforce. The National Institutes of Health (NIH), which funds more than 50% of all federally funded traineeships, provides a good potential model. Furthermore, the creation of large-scale integrated ocean research and observation programs offers new opportunities to support more fellowships and traineeships that allow the development of multi- or interdisciplinary educational experiences. Recognizing that this is an imbalance that must be corrected, the Commission recommends establishment of a NOAA traineeship program; initiation of this effort may occur under NOAA's Ocean and Health Initiative. Although the ocean science community supports the need for such a NOAA program, we also recommend that other mission agencies examine how each could create such programs to support a significant number of graduate students in a range of marine fields to ensure we have well-educated professionals for the coming decades.

Comment [SAP4]: Penny, where did this money come from and what did it support?

Finally, a strong national research infrastructure at centers of higher education and research is predicated on the availability of talented individuals who are well-educated and well-trained in science, mathematics and technology. Efforts to create a pool of such individuals must begin during elementary and secondary school and continue through graduate education and on-going professional development. Efforts underway, such as the Centers for Ocean Science Education Excellence and National Ocean Sciences Bowl, have begun to address needs along the educational continuum. As the Commission has recommended, more must be done to expand learning experiences and professional development for future marine scientists, technicians, educators and resource managers.

Increasing the investment in ocean science research. Much of the great progress made in marine science over the past several decades has been a result of federal investments made during the 1960s and 1970s, under the cloud of the Cold War. Under the model adopted by Vannevar Bush following World War II, the academic researcher, with public support, has been the leader in much of this scientific advancement. This model has led to great discoveries that have changed our lives, such as increased environmental predictive capabilities, a better understanding of the marine ecosystem and marine resource mapping, the ability to remotely sense ocean features from satellites in orbit, and national superiority in undersea surveillance and antisubmarine warfare.

Today, great advances in information and communication technology, molecular biology and other disciplines promise astounding returns from investments in ocean research by offering fundamentally new means of analyzing and understanding the biology, chemistry, geology and physics of ocean dynamics and processes. There is great potential to more fully predict ocean processes, discover marine organisms with unique capabilities, understand the linkages between human and ocean health, and provide the scientific basis to better utilize and manage ocean resources.

Unfortunately, U.S. funding for basic research in ocean sciences has remained stagnant for nearly two decades, effectively halving its buying power. At the same time, the total federal support of basic research has nearly doubled. While we are faced today with growing problems and opportunities, requiring an increased understanding of the Earth's oceans, resources to address them are insufficient. Society's increasing demands on the sea and the growing awareness of the human impact on the environment require ocean sciences to be at the forefront of scientific and social research. This requires a renewed commitment to marine scientific research.

Remarkable fundamental discoveries about the natural world have opened the way for an even more exciting and productive future. But this future will be unrealized without the wherewithal to support a robust and vigorous research enterprise. For this reason, personally and on behalf of CORE, I enthusiastically endorse the Commission's recommendation to double the federal ocean and coastal research budget over the next five years. The report proposes to increase the budget from the fiscal year 2004 level of about $650 million to $1.3 billion each year. While the overall levels should be doubled, increases for individual agencies and programs should be based on a careful and comprehensive assessment of priorities related to national ocean policy goals and needs and on the role of each federal ocean agency in carrying out that policy. For example, doubling of the NSF ocean sciences budget would be entirely consistent with efforts to double the agency's budget overall. By contrast, at NOAA, the Commission recommends new responsibilities in several areas such as ocean observing systems and oceans and human health that would require substantial new competitive research initiatives. Completion of the research strategy recommended by the Commission would address this concern and provide a solid blueprint for agency research investment. Similar strategic planning completed for the U.S. Climate and Global Change Program was instrumental to that program's success in the mid 1980s.

Strengthening the NOAA research enterprise. The summary of recommendations in the Commission's preliminary report devotes almost five pages to recommendations for NOAA and its line office, the National Marine Fisheries Service. As the nation's lead civilian oceanographic agency, NOAA clearly has a central role in implementing a national ocean policy and it is almost inconceivable that such a policy could be effective unless NOAA is successful in carrying out it ocean missions.

NOAA was established in 1970 under a recommendation from the report of the first Stratton Commission, bringing together the ocean and coastal-related programs and activities of several federal departments and agencies. Each of those initial elements brought along its own bureaucratic culture and approaches and over the years, NOAA has often struggled to create a fully integrated agency. In addition, it has faced enormous growth in its mission and statutory responsibilities, often not accompanied by adequate fiscal resources.

From a scientific perspective, a recent CORE survey indicated that NOAA currently is the third largest funder of academic marine research in the federal government. As such, it provides support for scientists at almost all oceanographic institutions and participates

in a number of national research programs. As national attention to climate, coastal and ocean management issues grows, NOAA support for mission-related research at academic institutions must increase. Although NOAA is poised to play a central role in the ocean sciences, its current programmatic, organizational and administrative structure offers real impediments to effective partnerships with the academic community.

In October 2003, NOAA requested that its Science Advisory Board establish a Research Review Team to evaluate NOAA science programs. In a preliminary report published in February, the team recommended development of an agency-wide research strategy and plan, and establishment of a senior-level research structure to provide more coherent research management and guidance for transitioning research into operations. A second phase of the effort is ongoing and will address the NOAA-wide research infrastructure including such issues as laboratory consolidation. The final report is scheduled for completion by the end of this month.

Enactment of a NOAA organic act that clearly lays out an integrated agency structure and mission, including its role in ocean and coastal research and education, is essential if NOAA is to address the Commission recommendations and the findings of the Research Review Team.

Ecosystem-based Management

The concept of ecosystems-based management is a key theme for the Commission report. It is a concept that enjoys broad-based support among managers, scientists, fishers, conservationists and other stakeholders because it makes sense both intuitively and scientifically. As the report states:

> "Ecosystem-based management looks at all the links among living and non-living resources, rather than considering single issues in isolation. This system of management considers human activities, their benefits, and their potential impacts within the context of the broader biological and physical environment."

The Commission also points out that the success of ecosystem-based management will rely on a balanced precautionary approach that weighs the level of scientific uncertainty and the potential risk of ecosystem damage as part of every management decision. At the present time, we simply do not have adequate information to reduce that scientific uncertainty.

In a 2000 report on marine fisheries data, the National Research Council recommended that fishery managers must improve their "understanding of the functioning of the marine ecosystems affected by fishing activities by studying important non-target species to determine their feeding habits, their distribution, and their prey and predators." In addition, we must shift from our current focus primarily on maritime activities to looking more broadly at the interrelationships among land-based activities, climatic and oceanic process, and marine ecological factors. It means, for example, recognizing that pollution

from Central and South Florida can harm fish and coral as far away as the Keys and beyond.

The implications of ecosystem-based management for ocean science are enormous. Federal and state resource managers typically have focused their support for research and monitoring on science that is very close to the decision at hand. Be it counting fish or mapping bottom habitat, the avenue of investigation has been relatively narrow. While we now realize the limitations of such an approach, we have just begun to define scientific needs and to develop strategies that will allow scientific inquiry to keep pace with the growing complexity of management needs.

For example, a Comprehensive Everglades Restoration Plan (CERP) is being implemented in my home state. Florida Bay is included in the CERP because of its intimate linkages with the Everglades. These include freshwater run-off, groundwater fluxes, and nutrient inputs. We currently do not know the biological and ecological effects of increased nutrient loading, particularly as it relates to the growth of phytoplankton and macroalgae in Florida Bay. One potential scenario is that nitrogen and phosphorus in the freshwater runoff from the Shark River Slough could increase phytoplankton blooms in the Bay, and that these blooms could be carried out to the Florida Reef Tract. The fact that we lack a circulation model that would enable us to link changes in Everglades hydrology with Florida Bay hydrology and ecology is hampering resource manages and restoration planners. A recent NRC report recommends research in several areas to remedy this situation.

Comment [SAP5]: Brian LaPoint promised to get me some text on Monday morning.

Implementation of an integrated and sustained ocean observing system could supply critically needed information for the transition to ecosystem-based management. Pilot observing systems already maintain the capability to monitor key physical parameters such as temperature and currents that control or strongly influence the impacts of human activities on the marine environment. The system would also provide longer time series needed to track climate and other sources of variability and to develop ecosystem forecast models.

At present, the primary source of biological information remains stock assessment surveys and other ship-based sampling programs. However, ecosystem-based management will require development of new technologies to explore, discover, and exploit these biological resources to their full potential. Scientists are already exploring a variety of techniques and platforms from *in situ* molecular analyses to satellite remote sensing to sophisticated tagging programs and marine cable systems that will allow marine animals themselves to serve as data collectors.

Without broader knowledge developed from a robust research and exploration effort, ecosystem-based management will be difficult, if not impossible. One important research need identified by the Commission is the study of marine biodiversity, and one effort to address that need is the Census of Marine Life. I currently serve on the U.S. national committee for the Census, an international research program to assess and explain the abundance, diversity, and distribution of marine organisms throughout the world's

oceans. The Census is focusing on field studies that explore little known habitats and re-examine familiar areas using innovative technologies. The Census is also developing an integrated biogeographic information system with the potential to bring marine biodiversity information into the ocean observing system data network. It is unique in its focus on diversity through the higher levels of food webs, the discovery and classification of newly discovered species, and its examination of timelines extending back beyond the limits of modern ocean science. Information collected will support modeling efforts to better understand the response of living marine systems to environmental change and harvesting.

The Census of Marine Life is just one example of cutting edge research conducted by academic institutions and government agencies throughout the United States—and in collaboration with international universities and government agencies—that will contribute to ecosystem-based management. It again reinforces the importance of working cooperatively to address complex management needs, an approach hindered, if not prevented, by current systems. Improved coordination will be absolutely critical if we are to begin managing the oceans in a way that takes into account the big picture instead of focusing narrowly on individual problems without regard to their interconnections.

Recommendations for Immediate Implementation

The third question posed by the Committee in your invitation letter is probably the most difficult. With the prospect of limited availability of new money, it requests that I identify the "top three" recommendations regarding ocean and coastal science that should be implemented immediately. As you know, the preliminary report includes almost 200 formal recommendations, in addition to hundreds of suggestions for strengthening ocean science and generating high-quality accessible information to inform decision makers.

Interestingly though, many of the most significant recommendations have a relatively modest price tag. What they do require is a national level of commitment to changing the way we do business in the oceans – if we do that, I am optimistic that the financial investments will follow more easily. In its executive summary, the Commission identified 12 actions that its members concluded were critical, of which I believe four are essential to ocean and coastal science and correspond to problems and issues identified earlier in my testimony:

- Strengthen NOAA and improve the federal agency structure
- Double the U.S. investment in ocean research
- Implement the national Integrated Ocean Observing System
- Increase attention to ocean education

The first of these is probably not a question of fiscal resources as much as structure and organization. Coordination of ocean and coastal science programs remains a top priority for strengthening ocean science and does not require enormous financial resources, but rather a commitment by a dozen or so federal ocean agencies to coordinate their efforts and implement improved mechanisms that will allow them to work together efficiently.

At the same time, new dollars clearly will be required to double the ocean research investment, implement an integrated ocean observing system, and improve ocean education.

With respect to research, for example, the Commission report calls for development of a national strategy for ocean and coastal research, exploration and marine operations that can "integrate ongoing efforts, promote synergies among federal, state, and local governments, academia, and the private sector, translate scientific and technological advances into operational applications, and establish national goals and objectives for addressing high-priority issues." Other sections of the report identify research areas where increased investment could lead to substantial benefits including climate and ocean modeling, biodiversity and ecosystem research, development of ocean information systems, and development of marine products. We have already begun this effort with proposed increases in ocean research programs such as the new centers for oceans and human health and NSF's international ocean drilling program. Proposed increases should be spread out over several agencies—in coordinated programs—so no single agency would bear the full cost. Similarly, implementation of the education recommendations should build upon existing programs and be coordinated across agencies.

Funding for the integrated ocean observing system may be more of a challenge since NOAA is the logical home for much of the program. Still, NOAA currently is making an initial investment through funding for a number of regional pilot programs. By providing needed leadership and coordination, those projects could be fully integrated into a larger scale effort and initiate the implementation process.

Conclusion

Though identifying many problems, the Commissioners and those of us fortunate enough to spend our lives studying the oceans recognize that they are still an awe-inspiring place with more than enough blue frontier to keep us exploring, discovering, and benefiting from those discoveries for the foreseeable future.

Next month, through State of Florida funding for a program called the Center of Excellence in Biomedical and Marine Biotechnology, a team from Harbor Branch Oceanographic Institution and Florida Atlantic University will be searching waters off Florida's east coast and the Florida Keys for new organisms that produce chemicals with the potential to cure human diseases from cancer to Alzheimer's. As startling as this may sound, even within a few miles of shore, our group will have no trouble finding places that no one has ever seen. And if history serves as a guide, we'll have no trouble making promising new discoveries.

But such programs are just a drop in the world's largest bucket, so another of the report's recommendations is that this nation begins a serious effort to study the 95% of the oceans that remain unexplored. There is still much to discover. For example, we have studied only a couple hundred of the estimated 30,000 seamounts—and the potential new fisheries they support. One of the most incredible scientific discoveries of the 20th

century—animals that depend not on photosynthesis, but on chemosynthesis—was realized through exploration of deep-sea vents. Since that discovery more than 25 years ago, we have explored less than 50 of the estimated 5000 deep-sea vents and seeps. I have no doubt that a robust ocean exploration program, coupled with development of novel techniques for *in situ* analyses of unique plants, animals, and microbes, will dramatically alter not only our understanding of life on Earth (and perhaps other planets), but also lead to new technologies and improved scientific understanding with benefits comparable, likely even superior, to those we have realized as a result of space exploration. As evidence, consider that past ocean-based discoveries have already advanced everything from biotechnology to telecommunications, and that several promising disease treatments from marine organisms are now in human clinical trials.

We clearly have a great deal of work to do. The Commission recommends a framework that will make that work possible, but only if we put it to use. So, for everyone who enjoys fishing, diving, spending a day at a clean beach, and eating safe seafood, I would urge you to act quickly and decisively to carry out the Commission's recommendations. With a clear path to follow, the support of stakeholders around the country, and your commitment to make necessary changes, we have a unique opportunity to develop and implement a strong ocean policy that can reverse the downward spiral of ocean health.